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ABSTRACT

Described is the Follow Through academic program based on the principles and materials (DISTAR) of S. Engelmann and W. Becker, and reported are results of program use over a 4-year period with 9,152 primary grade children (78 percent economically disadvantaged). The program description includes teaching procedures; program objectives; class schedules; staffing requirements; principles of class management; descriptions of the DISTAR reading, arithmetic, and language programs; the parent role; teacher training strategies; and the use of biweekly reports and continuous progress tests as monitoring procedures. Results of testing are given separately for the disadvantaged students and the entire group. Compared with national norms is achievement of Ss on the Wide Range Achievement Test in reading, spelling, and arithmetic; the Metropolitan Achievement Test (MAT); and the Slossen Intelligence Scale. Among results given are reading achievement by poor children starting the program in kindergarten at the 5.2 grade level by the end of third grade, average gain per grade in arithmetic of 1.02 grade levels, a gain of 9.6 IQ points during the kindergarten year which was maintained through the primary grades, and grade level or above performance on all MAT tests except reading comprehension by the end of grade 3. Also described are the teacher training format and attempts to correlate teacher performance with child performance. (DB)

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Engelmann-Becker
Follow Through Model

University of Oregon
Department of Special Education

PROGRAM DESCRIPTION AND 1973 OUTCOME DATA

by

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Part I: Program Description

I. Definition of Sponsors Approach

A. Philosophic Foundations

The Engelmann-Becker Model focuses strongly on academic objectives. The program is premised on the belief that every child can achieve well in the academic arena if he receives adequate instruction. The instruction has to be designed to begin with the skills the children bring to school and to build on them at a faster rate than would occur in a more traditional setting. The disadvantaged child is usually behind in relevant skills at the beginning of kindergarten or first grade (particularly language concepts). If he is taught at a "normal" rate, he will remain behind his middle class peers. To achieve a faster-than-normal rate, procedures developed by Bereiter and Engelmann for pre-school disadvantaged children have been adapted to a primary elementary curriculum and integrated with the basic principles of behavioral psychology. The procedures:

1. require a far greater number of responses from the child,
2. are adjustable to individual rates of progress,
3. use programmed materials which teach essential concepts and operations required for future tasks,
4. systematically use reinforcement principles to insure success for each child,
5. utilize novel programming strategies to teach the general case (usually called intelligent behavior) rather than focusing on specifics (usually called rote behavior, or rote memory).

The general philosophy of the program sponsors is that a child who fails is a child who has not been taught. The remedy is to teach the skills which have not been mastered.

B. Scope

The sponsor will cooperate with the local district in providing direct assistance and support for the Educational program, services to families which can be handled by Parent Workers, parent training programs relating to the classroom and to child management, and staff development. Psychological services not covered by the special training of teachers and aides should be provided for through consultants approved by the sponsor and the school district. The school district is solely responsible for health and nutritional services. It should be noted that in the area of parent training programs, the sponsor expects the local PAC to take the lead in procuring services from the sponsor and his staff to assist in implementation of local objectives for parents.

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In the area of educational programs, the sponsor provides for the core subjects in reading, arithmetic, and language. The local program is to provide for art, music, P.E., social science, ethnic studies, spelling, and writing in consultation with the sponsor. Where time conflicts arise, core subjects must be given priority.

Supplemental activities are determined partly by sponsor and partly by the sites. Supplemental activities that firm up or reinforce the subjects being taught are specified by us. Additional supplemental activities are more or less local options. For example, we specify that after lesson 140, all children are to read from readers, in addition to the reading in the small, structured groups. We do not specify the series that is to be used; however, we limit the choice. For example, we don't allow sites to choose sight reading programs. They can choose from a variety of programmed material and phonic series.

C. Objectives

1. By the end of the third grade, the children in the program who are taught a full lesson on at least 160 school days each year will as a group exceed average national norms on an achievement tests in reading, arithmetic, and language behavior.

2. Reading failures will be limited to (at the most) children with severe physical handicaps.

3. The children will learn to like school and learning. They will show confidence in achievement, persisitence in assigned tasks, and pride in self.

4. The children will learn to use effectively the English language for oral communication.

5. A significant percentage of the parent community (20 to 35%) will be actively involved in the operation of the program. The actively involved and employed groups will be expected to change in attitudes about school and what the school does for their children. They will learn skills which will upgrade their economic and social standing. They will report changes in attitudes about self, their school, their hopes for the children, all in the direction of "things are better." "The job is being done more effectively." They will express beliefs that something can be done to change schools and communities.

6. Parents not actively involved with the program at school will be taught ways of working more effectively to support the learning of their children. They will be found to use more positive reinforcement. They should change attitudes about schools, the progress of their children, and hopes for the future, but to a lesser extent than the involved group.

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7. The schools or institution should show an increased acceptance of a real partnership with parents, should endorse more strongly the use of parents as teaching aides and assistants, should change beliefs about who-can-be-taught-what-and-how, should re-evaluate its programmatic objectives and procedures at all levels.

D. Classroom Setting

When children cannot read, the primary means available for instructing them is by talking to them. To insure that more teaching goes on, one teacher and two aides are used in each class at beginning levels (1 and 2). The classrooms are set up so that the three "teachers" are working in booths (for sound control) with groups of 4 to 7 children. The teachers and aides become specialists in one of the three basic programs (DISTAR Reading, Language, and Arithmetic) and a schedule is devised to fit each school's timetable to rotate the children through teaching groups and other activities where the children work on their own, or as a total group. Approximately 30 minutes is used for small group instruction in each subject area at Levels 1 and 2. At level 3, 15 minutes of instruction is followed by 30 minutes of self-directed practice in workbooks which are later checked by the teacher. Typical schedules could look like these:

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1st Grade Follow Through Class

7:30	BREAKFAST					
8:00	OPENING ACTIVITIES					
20	Green Reading	Blue Language	Yellow Arithmetic	Red P.E.		
55	Red Reading	Yellow Language	Blue Arithmetic	Green P.E.		
9:00	RESTROOM BREAK					
25	LARGE GROUP ACTIVITIES · · · · LANGUAGE					
35	Yellow Reading	Red Language	Green Arithmetic	Blue P.E.		
50	Blue Reading	Green Language	Red Arithmetic	Yellow P.E.		
10:00	LARGE GROUP ACTIVITIES · · · · ARITHMETIC					
05	*	*	*	*	*	* Time Use to finish LARGE GROUP ACTIVITIES
15	Smith 15-40 LUNCH	Bobo 20-45 LUNCH	Ball 25-50 LUNCH	Coleman 30-55 LUNCH	Farned 35-0 LUNCH	
20	*	*	*	*	*	
25	GROUP P.E.					
30	Green Reading	Blue Language	Yellow Arithmetic	Red Unassigned		
35	Red Reading	Yellow Language	Blue Arithmetic	Green Unassigned		
12:00	Yellow Reading	Red Language	Green Arithmetic	Blue Unassigned		
05	Blue Reading	Green Language	Red Arithmetic	Yellow Unassigned		
25	REFRESHMENTS					
45	Smith-Mon. LIBRARY	Bobo-Tues. · · MUSIC ·	Ball-Wed. · ART	Coleman-Thurs.	Farned-Fri.	
1:00	FOLLOW THROUGH BUSSES - 2:30 DISMISSAL OTHERS - 2:45					
05						
25						
45						
2:00	PLANNING - INSERVICE TRAINING					
30						

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2nd Grade

Green Street Elementary School

Follow Through

7:30	BREAKFAST					
55						
8:00	OPENING SCHOOL ACTIVITIES					
15						
	G Reading	B Language	Y Arithmetic	R P. E.		
50						
9:00	R Reading	Y Language	B Arithmetic	G P. E.		
25						
	Y Reading	R Language	G Arithmetic	B P. E.		
55						
10:00	BATHROOM BREAK					
05						
	LARGE GROUP ACTIVITIES					
20						
	B Reading	G Language	R Arithmetic	Y P. E.		
50						
11:00	MUSIC — LIBRARY — ART					
10						
	LARGE GROUP ACTIVITIES					
40						
45	Green 11:40 LUNCH	Parsons :45 LUNCH	Prude :50 LUNCH	Abbott :55 LUNCH	Mills 12:00 LUNCH	
50						
12:00						
05						
10						
15						
20	Green Large group					
25						
30	GROUP P. E.					
55						
1:00	G Readings	B Language	Y Arithmetic	R Unassigned		
10						
	R Reading	Y Language	B Arithmetic	G Unassigned		
30						
	Y Reading	R Language	G Arithmetic	B Unassigned		
50						
	REFRESHMENTS					
2:40						
	B Reading	G Language	R Arithmetic	Y Unassigned		
20						
30	PREPARATION FOR DISMISSAL					
	DISMISSAL					
45						
	PLANNING —— INSERVICE TRAINING					
3:00						
30						

G = Green, B = Blue, Y = Yellow, R = Red

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3rd Grade

B. Laruie

9:00.	Reading 5	Arithmetic 4	Language 3	
30				
45	Reading 2	Arithmetic 5	Language 1	9:45 Thurs. MUSIC
10:00.	Reading 1	Arithmetic 3	Language 4	MUSIC
30				10:30
	RECESS			
45				
50	Reading 3	Arithmetic 2	Language 5	
11:20.				
	PENMANSHIP ------ SPELLING			
45				
55	LUNCH			
12:20.				
	STORY TIME			
12 35				
50	NOON RECESS			
1:00.				
	SCIENCE			
30				
	Reading 4	Arithmetic 1	Language 2	
2:00.				2:00 Friday
	PENMANSHIP ------ SPELLING			P. E.
30				
45	RECESS			2:45
	Monday----Religeous Ed. Tuesday---Soc. Studies Wednesday-Art Thursday--Soc. Studies			
3:15	Friday----Soc. Studies			
	Monday----Religeous Ed. Tuesday---Citizenship Wednesday-Firm Up Thursday--Firm Up			
30	Friday----Music			

Groups are numbered here

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E. Staffing Requirements

1. Level 1 and 2 programs require one teacher and two aides for each classroom of 25.

2. Level 3 and 4 programs require one teacher and one aide for each classroom of 25, except that if 1/3 or more of the level three children have substantially not completed the level two programs, one teacher and two aides should be budgeted.

3. There should be a continuous progress tester for each 150 to 200 children whose job it is to test the children on a 6 week cycle in each core area.

4. There should be one video operator for each 400 children. (This role may be combined with "3" above.)

5. There should be one video-data chief for each site.

6. There should be a parent worker for each 100-150 children. Professional guidance for parent workers should be provided for whenever possible.

7. There should be a local teacher supervisor (who has taught in the program and has been trained by the sponsor) for each 200 children. Otherwise a sponsor consultant is required until local supervisors can take over.

F. Classroom Management

The teachers and aides all "teach." They play active roles in the learning process for all children. The teacher is responsible, however, for supervision of the aides and general classroom management. All classroom personnel are accountable to the principal, local supervisors, the parents of the children, and to the sponsor for the progress of their children. It is our joint task to work together to insure that the children are taught what they need to be successful in school and life.

Teaching Method. The DISTAR programs are just words on paper. In order to teach these skills, the teachers and aides must understand the concepts and operations they are teaching and must have a number of basic teaching skills. These skills involve management of the children and organization of the teaching materials so that both the children and the teacher are ready to work when they sit down in an instructional group. Beyond that, the teacher needs to know how to teach a task--any task. Programs can be broken down into tasks. Tasks also have components:

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Pre-Task	Task		Post-Task
Get everyone's attention	Present a task signal(s) and teach the children how they are to respond.	Signal the children to respond	Reinforce or correct.
"Listen"	Show the letter m. "This is mmmmm."	"What sound is this?"	"Good."

Efficient teaching aims at getting a high rate of correct child responses within the teaching time available. To accomplish this, the teacher needs to know the formats (tasks) in the program well. She needs to know how to use attention signals to get the children to respond together (or individually) on cue. These latter signals we call "do it" signals, since they tell the children it's their turn to "do it." In small group instruction, "do it" signals are critical in being sure each child learns what the teacher is teaching, rather than just imitating what another child is saying. The teacher also needs to learn how to pace each task appropriately, quickly enough to hold attention, yet going slowly when required to give the children "time to think."

The teacher needs to learn to use reinforcers effectively to strengthen correct responding and to correct mistakes in a way which permits all children to learn each task (criterion teaching). For the most part, teacher praise or confirmation for correct responses is all that is required for reinforcement when the teacher's signals and pacing are sharp. Occasionally, tokens or edible rewards are needed to get the process going. Efficient correction procedures are based on an analysis of the kinds of errors children make. For elementary tasks, there are just three. If the child cannot make the motor response, the teacher leads him through it several times or breaks it into a simpler response and then puts it back together. If the child has responded to the "do it" signal with a response in the appropriate class, but has the wrong response (the child says "sss" to m), he is given the answer and the task is repeated. If the child, fails to respond in the right class (says "yes" to m), the task is modeled (and often several related tasks are given) to teach him to respond to the signal which calls for a sound rather than "yes" or "no." The teacher needs to learn not to pass over a mistake, and to repeat the entire task after a correction is made so that she is sure her correction has been effective. With advanced tasks involving more complex formats, the teacher needs to learn how to pinpoint the error and present a pair of tasks selected to teach a critical discrimination. Throughout, what counts is the outcome- whether the children can perform the tasks being taught.

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G. The Sponsor's Core Instructional Program

The core of the instructional program consists of programmed teacher presentation materials in reading, arithmetic, and language at three levels which is published by Science Research Associates under the trade name DISTAR (Direct Instructional Systems in Arithmetic and Reading).

The act of teaching involves getting children to make the right response in the presence of the right stimulus. When the teacher presents a letter m and asks, "What sound is this?," the children are to learn to respond "Mmmmmmm" and not some other response. To achieve the theoretically simple goal of getting children to make the right response in the presence of the right stimulus, however, the teacher must have tools and skill. The primary tool that she needs is an effective instructional program, whether she makes it up or uses one that is published. If used properly, this tool should help the teacher in the following ways:

It should provide her with examples of concepts that are clear.

It should indicate in detail how she can phrase tasks, questions, and directions so that they are clear and unambiguous.

It should sequence the various skills that are to be taught so the children proceed a step at a time.

It should further sequence skills so that the teacher uses her time efficiently, by teaching more than one skill during a lesson.

It should teach "the general case" so that the children master generalized concepts and operations that can be applied to many situations (rather than learning facts and idioms that apply to only limited situations).

The DISTAR programs have been designed with these considerations in mind. With proper training, the programs permit a paraprofessional to become an effective teacher in a relatively short period of time.

1. Distar Reading I and II teach decoding and comprehension skills. Decoding is the process of translating visually presented letters into specific sounds and words. Comprehension involves knowing the concepts the words stand for.

   After sounds and pre-Reading skills such as rhyming and blending are presented, the children are taught to read words. First they are taught regular words, such as sam, where each symbol is named by a single sound and each sound is continuous. The next set of words has a stop sound (a sound that cannot be held) first which makes blending more difficult--hat, can, tan. All words up to this point in the program can be sounded out, blended and said. Irregular words cannot be approached in this way. If the word was were spelled by sounds, it would be wuz. The children are taught that there are many exceptions in reading. These words are taught as special cases and the children are taught to

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recognize them by sight. The final decoding skill taught is the special sound that letter combinations make. These are also irregular in that they cannot be decoded by sounding out each letter. The sounds of ou are very different when they appear in the word cloud than when o and u do not appear together. Sentence Reading comes next. First the children read the sentence with a signal for each word, then they read the entire sentence from one signal. The teacher asks comprehension questions about several of the sentences and about the story. The story's content is usually novel--animal characters, exaggerations and surprises. More advanced comprehension skills are taught in Read the Items. For example, the children read item 4. "When the teacher says, 'stand up,' read item 6." Item 6 says, "Hold up three yellow cards." The children must read each word carefully or they will not be able to follow the instruction.

2. In Distar Reading III the children are taught to read for new information. The program is intended to teach children to read textbooks on their own and answer concept questions. Some of the stories are historical. In some cases the event is retold; in other cases two characters travel through time and experience life as it was lived in earlier times. Most of the stories are science related. The children read about scientific laws and then apply what they have read to exercises that follow the story. They use what they have just read to figure out problems. Topics such as astronomy, muscles, measurement, speed and the atom are presented.

   The Distar Reading programs are designed to produce fluent accurate readers who are able to read school text books, follow a variety of instructions and answer a wide range of comprehension questions.

3. The Distar Arithmetic programs are designed to teach the usual problem solving operations so that the children understand how an operation works and why they are using it. They are taught their arithmetic facts after they understand and can perform the operation. Finally, they learn the several fundamental laws or rules of mathematics. Arithmetic I teaches problem solving operations based on counting by one. In addition, they count forward to the number they start with and count forward by one for each number that is added. In 7+3 the child counts 7 and then counts three more times for the plus three--8, 9, 10. In subtraction they count forward to the number they start with and count backward by one for each number that is subtracted. In 7-3 the child counts 7 and then counts backwards three times for minus three--6, 5, 4. Algebraic variations of addition and subtraction are also taught. The children work problems on paper and on their fingers. They use both methods to solve story problems. The equality rule gives the children a problem solving strategy that they can use with any of these problems. The rule is: "As many as you count to on one side of the equal sign, you must count to on the other side of the equal sign." After figuring out which side they count on first in a problem and whether they add or subtract, the children are ready to solve the problem. The children are expected to memorize 20 facts during the Level I program.

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4. In Level II Arithmetic the children are taught new counting operations--in multiplication they count by numbers other than one and in fractions they count parts, numbers less than one. They work regular multiplication problems (2x4 which is originally read as "Count by 2, four times.") and algebra problems (2x ? = 8). They can use a chart or their fingers to work the problems. In fractions they learn to decode the fraction (in the fraction 2/3 the bottom number tells us that there are three parts in each group and the top number tells us that we have two parts); learn to tell whether a fraction is less than one, equal to one, or more than one; and multiply fractions and reduce their answer--if it reduces to a whole number. The main rule they are taught in Level II is an extension of the equality rule. The revaluing rule involves changing how many there are on one side of an equation and then changing the other side in the same way so that the equality relation is preserved. When you change how many you have on a side, you revalue the side. The rule states: "Whatever you do to revalue one side of an equation, you must do to revalue the other side of the equation." If you have 4=4 and you change one side--4=4+2. The equation is no longer true. You must revalue the other side--4+2=4+2 or 4+1+1=4+2. Now the sides are equal again. Using this rule, the teacher can show why the associative, commutative and distributive laws hold. Before presenting the remaining addition facts, the teacher shows how the facts fit together--that they are not an unrelated set of statements. Analogies teach that sets of numbers follow rules. Fact derivation is a method for figuring out an unknown fact working from a known fact. You don't know what 2+5 equals, but you know that 2+2 equals 4; so you count.

$$2 + 2 = 4$$
$$2 + 3 = 5$$
$$2 + 4 = 6$$
$$2 + 5 = 7$$

Then the children are taught a few facts each day so that the facts are memorized.

5. In Level III Arithmetic the children are taught three new operations--algebra, factoring and division--and the traditional arithmetic operations are extended. Algebra uses the revaluing rule, for example, a + 7 = 9. To solve for a, you must change +7 into zero; you must minus seven. If you minus 7 on the left, you revalue the side. You must minus seven on the right. a = 9-7. Factoring is the beginning of division. The children count by different numbers in order to find pairs of factors for a number. They use the same algebra multiplication counting operation they were taught in Level II. The number is 12. When you count by 3 you hit 12, so 3 is a factor of 12. When you count by 3 to 12, you count 4 times. 4 is the other factor. The children are taught to work problems such as those below.

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$$\begin{array}{r} 329 \\ 1412 \\ +\ 706 \\ \hline \end{array} \qquad \begin{array}{r} 473 \\ -129 \\ \hline \end{array} \qquad \begin{array}{r} 623 \\ \times\ 4 \\ \hline \end{array} \qquad 4\overline{)137} \qquad 6 - 3 \times 2 + 1 =$$

$$\frac{6}{3} - \frac{1}{3} = \qquad \frac{4}{3} + \frac{2}{3} = \qquad \frac{3}{2} \times \frac{1}{4} =$$

The children also use these operations in solving story problems.

As new rule per se is not taught; rather how a rule or equation can relate a set of instances to a set of answers. In substitution the children are given the rule and a set of instances. They derive the set of answers. If the rule were a+6 = ? and a = 2, then a+6 = 8; if a=3, than a+6 = 9. In analogies the children are given a set of instances and the set of answers. They derive the rule.

Instances	Answers
n	rule?
3	4
7	8
4	5

Before subtraction facts are taught, the relation between addition and subtraction facts is taught. If 9+3=12, then 9=12-3 and 3=12-9. Then the subtraction and multiplication facts are taught.

6. In the Distar Language I program the children are taught object names, object properties, and relationships among objects. They are also given practice in making a wide variety of statements. Some of the object properties taught are color, shape, pattern, parts, use and location. The relationships include quality, comparisons such as bigger; quantity, only, all, some, and none; space, prepositions; time, before-after and first-then; conditionality, if-then and and-or; causality, why; and multiple attributes, talking about two properties or relationships at once. A picture shows three balls--one small and yellow, one large and blue and one small and blue. When the teacher says, "Show me a small blue ball," the child must listen to both the comparison small and the color blue. If the child just attends to small, he may pick the small yellow ball. If the child just attends to blue, he may pick the large blue ball.

7. In Language II new object properties and relationships are taught--materials that objects are made of, new information such as measurement and the calendar, and the creative use of prior information, e.g., thinking up new functions for objects based on the children's knowledge of the object's properties and detecting absurdities in made up objects or situations and tell why the picture is absurd. A picture might show a golf ball with a large handle on it. The emphasis in Level II is on new ways of talking about objects and using words to talk about other words. The first new way of talking about objects is an extension

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of multiple attributes. Description tasks teach the children to identify many properties or relationships that they see in certain objects or events. In some tasks the object being described is referred to by a nonsense name. The children must focus on the properties so that they can figure out the object's real name. In classification the children group different objects or events according to common shared characteristics. Things that we can eat are food. Man made things that take us places are vehicles. Definition tasks set one object off from all the other objects being considered. The object is placed in the smallest possible class, and then characteristics are identified that set the object off from other members of the class. A car is a vehicle (the smallest class) that drives down the road (sets car off from other vehicles such as ship or airplane) and has a trunk (sets car off from other vehicles that drive down the road such as a truck or bus.) To teach questioning skills, the teacher thinks of an object. The children ask questions such as, "What class is it in? Where do you find it? What parts does it have? How do you use it? What is it made of?" By asking these questions the children can identify the object. More difficult tasks use words to talk about the other words. Synonyms and opposites are rules for relating one word to another word. The synonym for hard is difficult. Some of the analogy rules that relate words to each other follow: A word is to its synonym. An object is to a part of that object. An object is to how that object is used. An object is to what that object is made of. An object is to where you find that object.

8. In Distar Language III the children work from statements in a problem solving situation. They look for information that is provided by the statement. In the statement "The boy is smiling," you know what the boy is doing, but you do not know why he is smiling or what he is wearing. After the children know what information is provided, they determine whether the information is redundant, whether the information is relevant, and whether deductions based on the information are true, false or doubtful.

   Goal: A boy wants to eat cereal and milk.

   Statements: The boy had cereal but he could not find any milk. (relevant)
   He wore a red shirt. (irrelevant)
   He cound not find any milk. (redundant)

   Deductions: He can have milk and cereal now. (false)
   He will never eat milk and cereal. (doubtful)
   He must obtain some milk if he wants to eat milk and cereal now. (true)

   A second goal of the Level III program is to teach grammer--to discriminate between sentences and fragments; to identify subjects, verbs, and predicates; to make subjects and verbs agree; to discriminate among and punctuate statements, questions and commands; to identify adjectives and adverbs; to use proper verb tenses; and to punctuate, capitals, commas, quotation marks, contractions, abbreviations, Throughout Level III the childrens' writing skills

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are developed. The children use written statements to answer questions, make up stories, and describe events or objects.

H. Transitional Programs

When children have completed the three levels of the program the project manager, in cooperation with the on-site supervisors and the director, initiates instruction in the textbook series that the children will be using the following year (or the 4th grade) in the schools, and specifies activities and formats that should be used to supplement the instruction so that the children will transition smoothly and retain the skills taught in the three levels of the DISTAR programs. The children who have completed the level 3 program start on the second or third grade of the basal series they will use. The decision is based on nature of the series and its difficulty and the firmness of the the children.

A different type of transition is used for those children who have not completed the third level of the program before the end of their third grade year. These children work on a specified variation of the E.B. program (a shortened version with some of the activities presented to the entire class rather than to small groups). In January or February, they also begin work on the textbooks that will be used during the following year. They work on skills and terminology that has not been taught in the E.B. program. The idea is to (a) get them as far through the DISTAR program as possible, and (b) acquaint them with the conventions and skills that they will use during the following year.

I. Parental Role

While a major concern of our program is on more effective teaching at school we are also very concerned with providing parents with skills important for their own futures and skills for teaching their children. The approach to parent change is the same as that for children. Teach them. Our program has been designed to involve parents in training at several levels. Parents can become teacher aides or assistant teachers. Parents can be taught testing for the continuous evaluation of the progress of the children. Parents can serve as family workers. Parents can be hired to serve as the video camera operators and data chiefs. For the parents not actively involved with the program at school, a training program provided through visitation by other parents is used to teach the parents about the program and to teach the parents how to actively support the learning progress of their children.

As noted in I.B. (Scope), the local PAC must decide to what degree and how our parent training programs are to be used.

We are firmly committed to support a parent community - LEA partnership in the operation of our program. The rationale for this is simple. Our goal is an improvement in the lives of disadvantaged families. Unless the members of such families have the right to judge the effects of a program for themselves, we have no criterion of success nor guides to improving our efforts. We serve in a community at the pleasure of the parents of the children involved in the program.

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II. Delivery System

There are five basic components to our system:

1. Increase the manpower in the classroom,
2. Structure the daily program to insure that the teaching personnel have a clear plan of action,
3. A teaching method that utilizes basic behavioral principles to insure efficiency in teaching,
4. Continuing training in the use of the programs, and
5. Continuous monitoring of the progress on the children and the skills of the teachers and aides to be sure the system is functioning.

In previous sections we have described the classroom structure, program, and teaching method. What remains to be described in this section are the training methods used to get the programs into operation, the monitoring systems to insure their continued effective use, and evaluation activities.

A. Training Strategies

The goal of training is to provide the teacher with the skills outlined earlier (I.F). This is accomplished in a two-week preservice workshop, continuing inservice sessions of about two hours a week, and through classroom supervision. A number of detailed procedural manuals have been prepared for trainers and participants in training. The key is to know what the teacher should be able to do, and to devise procedures to teach the required skills. It should be recognized that precision in specifying and training essential teaching skills is only possible within a structured teaching system.

The preservice workshop focuses on teaching the general requirements for teaching any task. This is accomplished through a variety of exercises that involve analyzing a task into its components and through demonstration and practice with a variety of key tasks from each of the programs. The use of signals, precise presentation of tasks, reinforcement, and corrections are emphasized. The procedure is not unlike an actor learning a new role in a play. The participants work mostly in small groups with a supervisor serving as a coach. Checkouts for proficiency are required periodically throughout the workshop. Time is also devoted to planning classroom schedules and the use of continuous testing for monitoring of progress and regrouping of the children.

A video tape library illustrating how to give key tasks in the program is available for inservice training. While the preservice training focuses on general requirements for teaching and the key formats for the first 30 to 60 days of given program, inservice training sessions focus mainly on preparing teachers for new formats coming up in their programs. The procedure is still basically the same: practice, critique, practice, checkout. The video tape library allows a teacher to practice new formats on her own. Video tapes of classroom teaching are also used in training. Some of these tapes are sent to the sponsor for review and critique.

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Another phase of inservice training involves a programmed course in behavior modification and the teaching principles underlying the model, (Becker, Engelmann, and Thomas, 1971). This is conducted on site and course credit is provided for this training through the University of Oregon.

Classroom supervision is provided by consultants trained by the sponsor. Many of these are former teachers from the local site. There is approximately one local supervisor for every two hundred children in the program. In working with teachers (and aides of course), the supervisor observes the performance and provides a critique. The supervisor may actually stop a teacher presentation and give a demonstration to the teacher using her group. Assignments may be given on a specific skill to be checked out on the supervisor's next visit.

Teacher supervisors are also required to make periodic video tapes of their supervision procedures which are reviewed by our project managers.

The project manager assigned to each site is ultimately responsible for the training and implementation of the teachers and aides at that site. The project manager is responsible for: (a) the pre-service training, (b) the inservice training, (c) identification of groups, teachers, or aides who are below performance standards on specific formats, tracks, and tasks. The project manager uses: (a) continuous tests, (b) video tapes of teachers, aides and supervisors, and (c) error data on the worksheet performance of children to identify problems.

The project manager gives assignments to the local teacher supervisors (supervisors who are hired by the district and who work on site.) The local supervisor has three primary training obligations: (1) conducting pre-service and inservice; (2) working in the classrooms with teachers and aides (which activity consumes perhaps 80 per cent of the supervisor's time); (3) identifying and reporting on problems with the instructional materials, problems with schedules, problems related to training of teachers and aides, and general problems of implementation (material not ordered, no teacher in a classroom, etc.).

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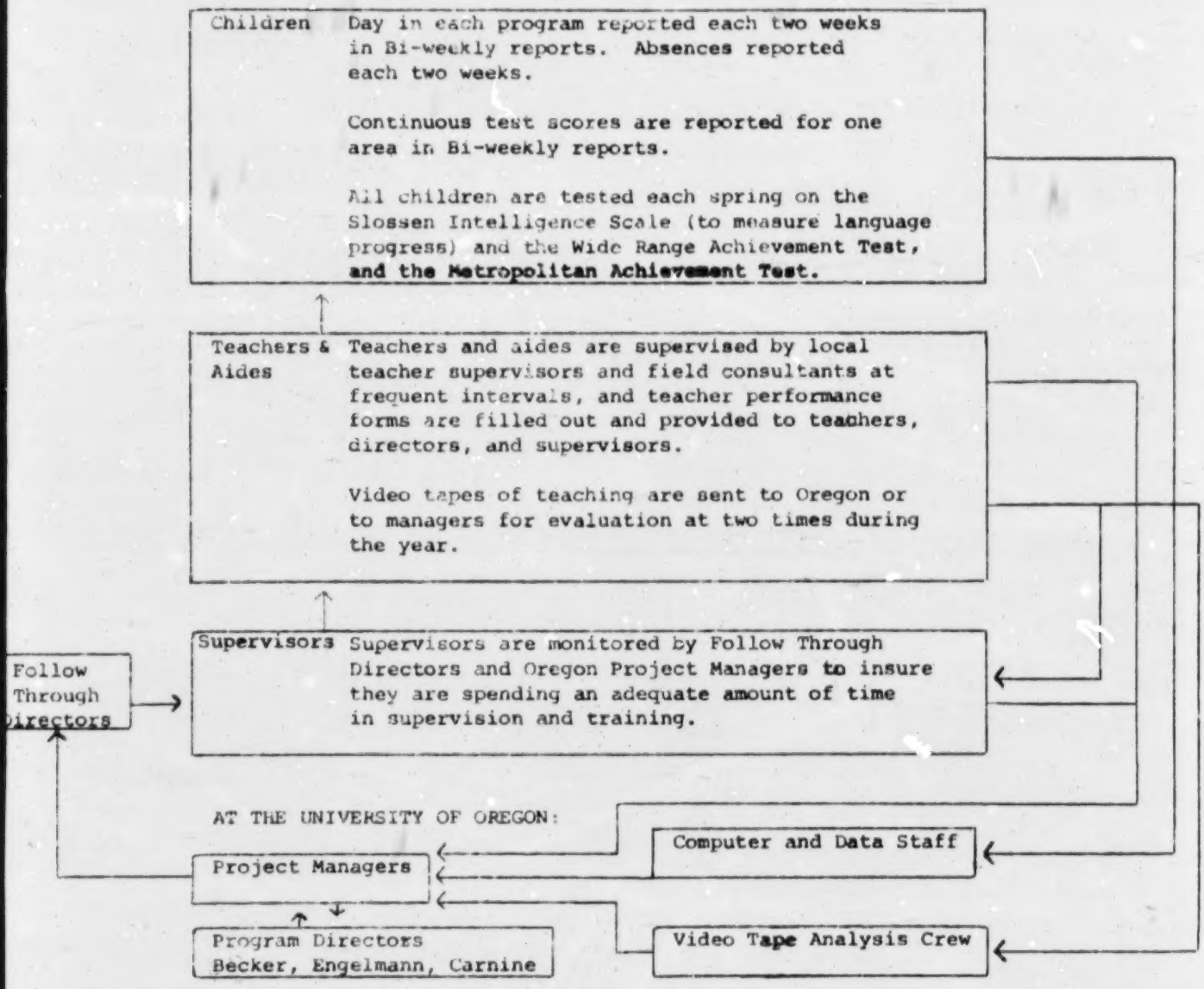
B. Monitoring (Quality Control)

The management of the progress of more than 10,000 children in 20 locations around the country requires a carefully designed monitoring system. An outline of our monitoring system follows (insert diagram 19A. Note that monitoring procedures related to training were discussed in the section in training.

1. Diagram of Monitoring System

AT THE FOLLOW THROUGH SITE:


Children
Day in each program reported each two weeks in Bi-weekly reports. Absences reported each two weeks.
Continuous test scores are reported for one area in Bi-weekly reports.
All children are tested each spring on the Slossen Intelligence Scale (to measure language progress) and the Wide Range Achievement Test, and the Metropolitan Achievement Test.
Teachers & Aides
Teachers and aides are supervised by local teacher supervisors and field consultants at frequent intervals, and teacher performance forms are filled out and provided to teachers, directors, and supervisors.
Video tapes of teaching are sent to Oregon or to managers for evaluation at two times during the year.
Supervisors
Supervisors are monitored by Follow Through Directors and Oregon Project Managers to insure they are spending an adequate amount of time in supervision and training.
Follow Through Directors
AT THE UNIVERSITY OF OREGON:
Computer and Data Staff
Project Managers
Program Directors
Becker, Engelmann, Carnine
Video Tape Analysis Crew

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2. Bi-Weekly Reports and Continuous Progress Tests

Built into the DISTAR programs are teacher-given tests to check each new skill as it is taught. To monitor child progress independently of the teacher, continuous progress tests are given in each area each six weeks by paraprofessionals at the Follow Through sites. Every two weeks test results in one area are summarized by child on four-copy IBM forms, (with names and numbers preprinted by group). These biweekly reports also show absences for the two-week period and show where each group is in each program. Copies of the reports go to the teacher, the supervisor, the Follow Through Director, and our data analysis center. The reports can be used locally to directly regroup the children or to provide special remediation or acceleration. They also provide a basis for summary analyses of progress for management by the sponsor. Trouble spots can be determined and worked on.

The Arithmetic I Continuous Test will be used as an example for all of the tests. The test consists of several tracks which cover the major skills in the program. Examine the child record form on the next page.

The abbreviations across the top of the form stand for the skills. OC stands for object counting; CTN stands for counting to a number. Along the left side are lesson ranges. The first range is from 1 to 43, the others progress in 10 day intervals. According to a child's lesson day in program when he is tested, he fits within one of the lesson ranges. The lesson range will determine which skills will be tested and the expected scores (baseline) for each child. A child on day 100 in the program should pass test items 7, 15, 25 and 30. He should fail items of a higher number in the given tracks and pass those of a lower number. Since each item is selected to reflect 10 days progress in the track, the scores are directly interpretable. For example, a child at program day 100 who passes only item 23 in track CFNTN (counting from a number to a number) is 20 days behind where he should be in that track. He should pass item 25, but falls two items below. Each item is worth 10 days. Similarly, a child who passes item 27 in the same track would be 20 days ahead of where he is placed in his group. To make the continuous tests maximally useful to the teachers, keys are provided. The Continuous Test Keys look like Record Form 2 but give the teacher precise information about where to find examples in DISTAR lessons of the skills that need remediation. For example, if a child fails item 25, the Key tells the teacher to go to Lesson 100, Task 1. For each test item there is an item specified in the program to show the teacher what skills need to be taught. With these procedures, diagnosis is immediate and directly informative to the teacher.

Management reports are produced by computer from the biweekly reports. These reports keep track of group gains in lesson days and on the Continuous Progress Tests. Projections are made and compared with target goals for each group for the year. When projections fall behind goals adjustments in the program can be made at the site to attempt to reach goals before it is too late to do anything about it. Management reports also keep track of school calendars and absences so that it is possible to base projections for each site on local conditions that affect teaching days available.

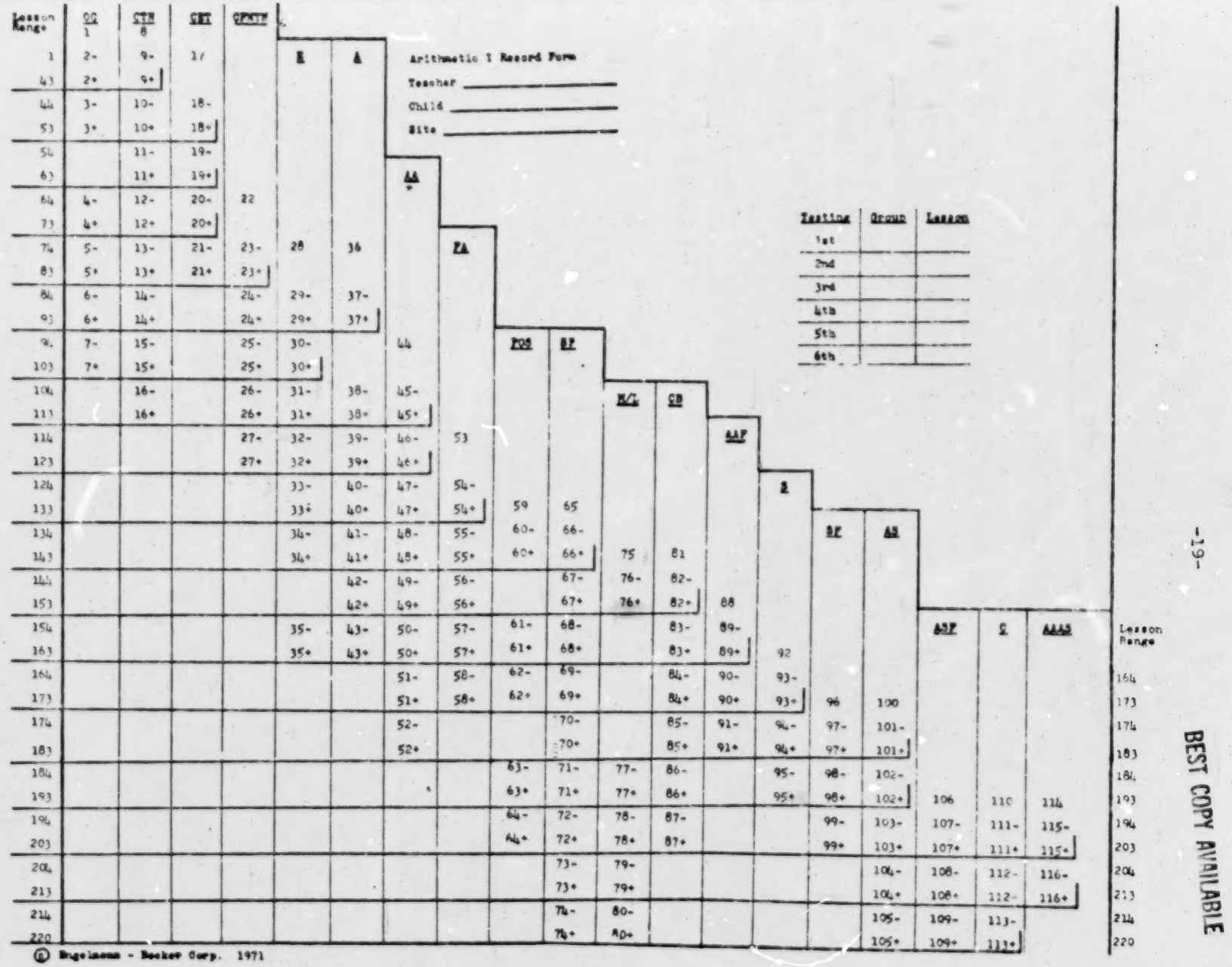

FIGURE 1

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PART II

SOME ILLUSTRATIVE RESULTS

Since the fall of 1968, five entering-level groups of children (called cohorts) have completed at least one year of the program. Very little data were gathered on the 68-69 starting cohort and it is not included in Figures 5 through 8, although what results are available are included in the averages presented in Figures 2 to 4.

The analyses to be presented are based on children who entered the program at a beginning level, who averaged at least 130 days attendance per year, and on whom there were at least two tests available for computing gains scores. There were 9152 children available under these rules. Of these 7168 (78%) came from homes defined by OEO guidelines as poor. Since Follow Through was designed primarily to help the children from poor homes "make it" in school and life, we will focus our data presentation on the results for poor children only. When all children are included, the averaged grade-level scores are about .1 to .2 grade levels higher (Becker and Engelmann, 1973). The separate analyses of data for children who entered the program beyond the first year, or who were present for only one testing indicate that on the average these children are not as advanced in the instructional programs and are somewhat behind on achievement tests. It should also be noted that children who were retained (about 7%) are included with their starting classmates.

Mean Results by Grade Level Averaged Over Cohorts

Figures 2, 3, and 4 show the mean grade-level scores on the Wide Range Achievement Test (WRAT) in reading, arithmetic, and spelling for poor children. In Figure 3 it can be seen that poor children starting the program in kindergarten leave third grade with an average reading level on the WRAT of 5.2 grades. The children have learned decoding skills well. Children starting the program in first grade leave third grade with an average reading level of 4.5 grades. It should be apparent that starting teaching earlier gives the K-starting children an advantage of .7 grade levels by the end of third grade.

Figures 3 and 4 show that in arithmetic and spelling, the K-starting poor children in the program are near or above grade level, but seem to be loosing some ground. The 1st-starting children are a little below grade norm. As later figures will show, an analysis of gains by cohorts shows that with successive waves of children we are overcoming this problem. The problem in arithmetic arose from our initial focus on reading. Arithmetic did not get taught as much and was usually taught by aides. Also, program revisions have been needed to accelerate the teaching process. In spelling, we have never offered a formal program, we have only taught the subject as a by-product of reading. In later cohorts it was necessary to encourage the teachers to more formally teach spelling.

In evaluating these overall findings with poor children, the reader should keep in mind that the average gain per year with such children has typically been reported at .6 grade levels.

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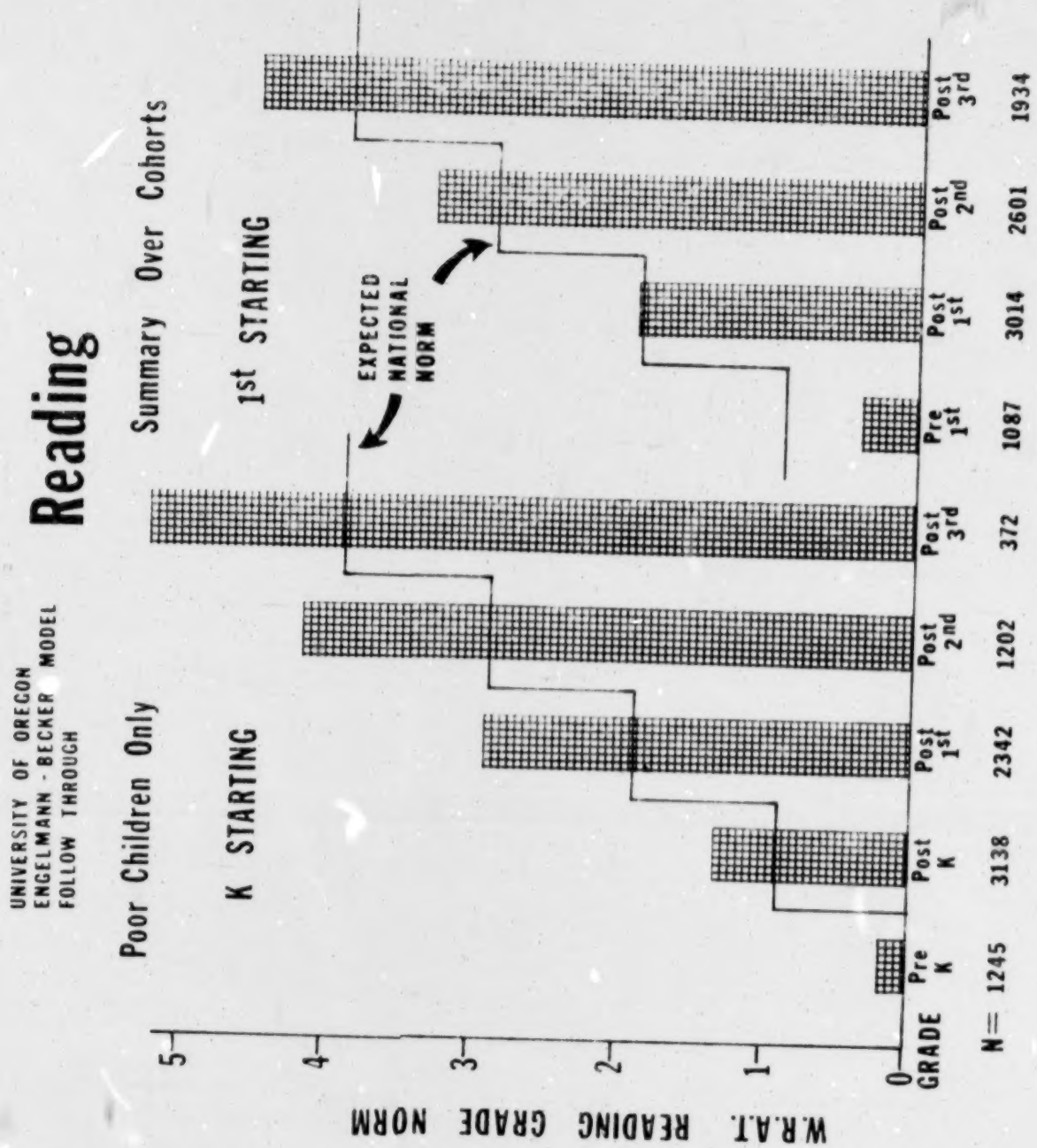

Fig. 1

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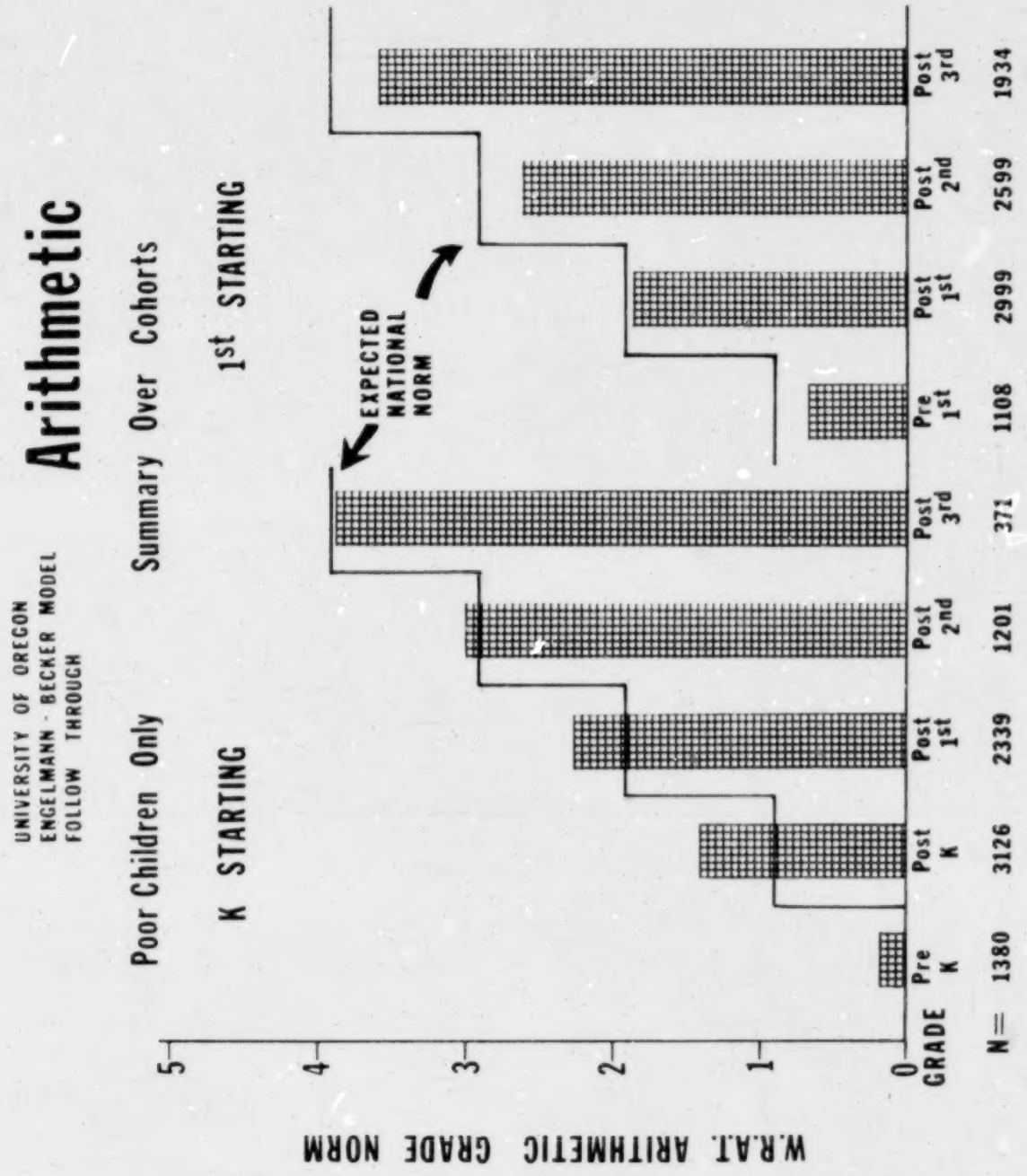

Fig. 3

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ENGELMANN - BECKER MODEL
FOLLOW THROUGH

Spelling

Poor Children Only Summary Over Cohorts

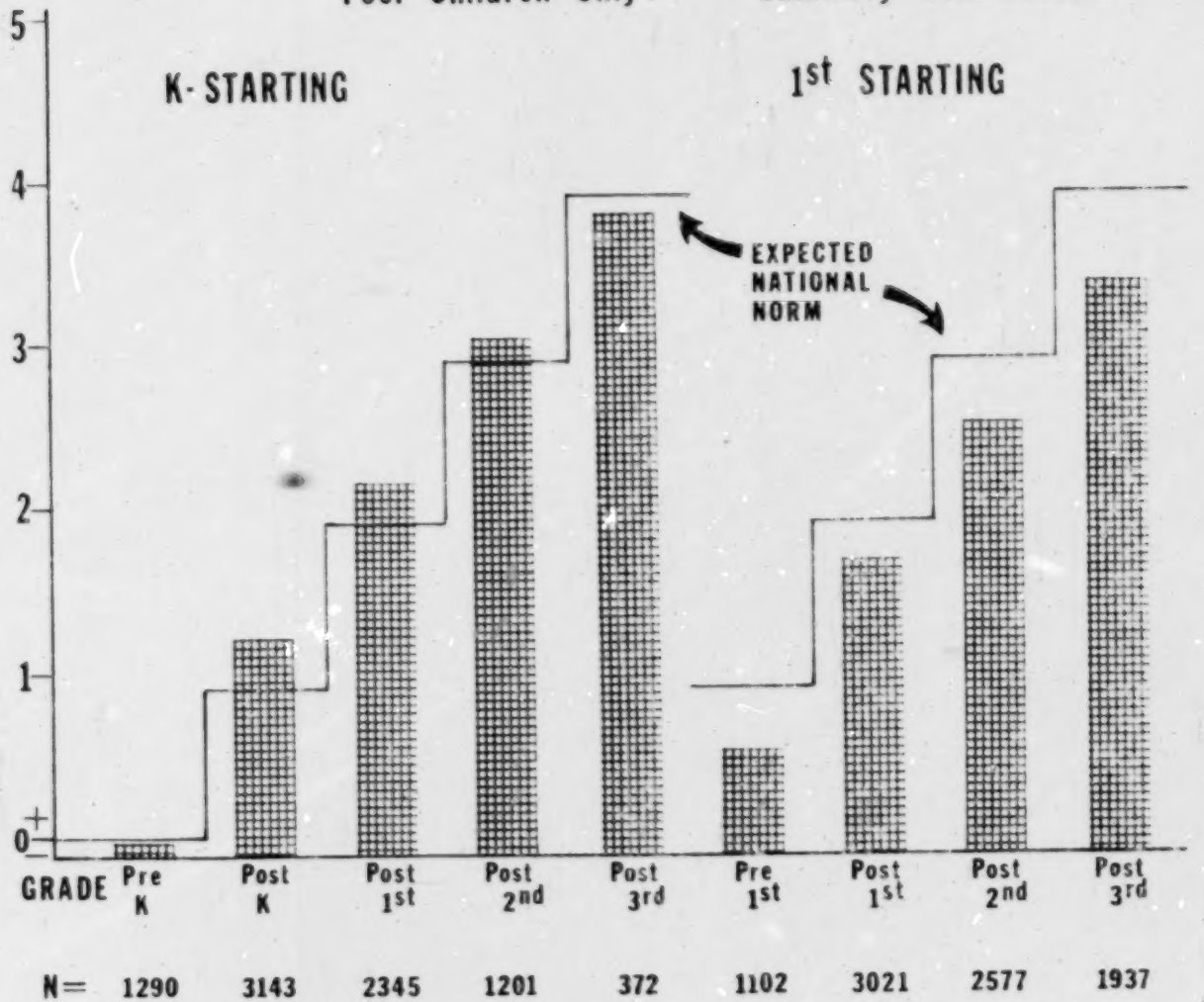

Fig. 4

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Gains-Score Analysis by Cohort

Figures 5 through 8 give a gains-score analysis by cohort in reading and arithmetic. Spelling graphs have been omitted because the results are very close to those in arithmetic. Because of changes over time in testing practices and incomplete testing, we have examined gains scores on a year-to-year basis. This allows us to greatly increase the N on which conclusions are drawn over that obtained when only children tested every year are included.

The average gain per grade in reading was 1.44 grade levels for K-starting children and 1.52 grade levels for 1st-starting children. One can see in Figure 5 a clear trend toward an improvement in level of performance in later cohorts. The same trend is not apparent in Figure 6. At the end of third grade, K-starting poor children exceed national norms on the WRAT by a whole grade level.

The average gain per grade in arithmetic was 1.01 for K-starting children and 1.03 for 1st-starting children. The Wide Range is not sensitive to our program effects at the second level. The test covers only 4 items at this level, mostly in formats the children have not been taught. Figures 7 and 8 show that K-starting poor children reach grade levels by the end of third grade while 1st-starting children fall short. This problem is being overcome in later cohorts. We have introduced procedures to be sure more children get through the instructional program. Once this occurs, our evidence shows that they will test above grade level.

IQ Gains

Gains on cognitive measures are an expected outcome of the language concept of instruction and logical operations taught in the E-B program. Table 1 summarizes our current findings on IQ gains using the Slosson Intelligence Test with poor children only. For children in kindergarten programs, there is a strong gain during the kindergarten year. The average over four cohorts is 9.6 IQ points with an N of 1196. Beyond the kindergarten grade the gains appear to be minimal, but we must await future completions of the program before strong conclusions can be made. Note that with poor children there is typically reported a decline in mean IQ from kindergarten through third grade.

The IQ gain data for children starting in first grade are more consistent and based on larger samples. Except for cohort 1 the gains appear to be cumulative and substantial from first to third grade, averaging about 8.5 IQ points on 1000 to 1400 children.

There are a number of reasons for believing that the IQ gains obtained so far represent little more than 30% to 40% of the potential of the present teaching system. Even so, they suggest an important and powerful gain (against a typical loss in comparison groups) in level of general cognitive functioning as one outcome of the Engelmann-Becker Follow Through Model.

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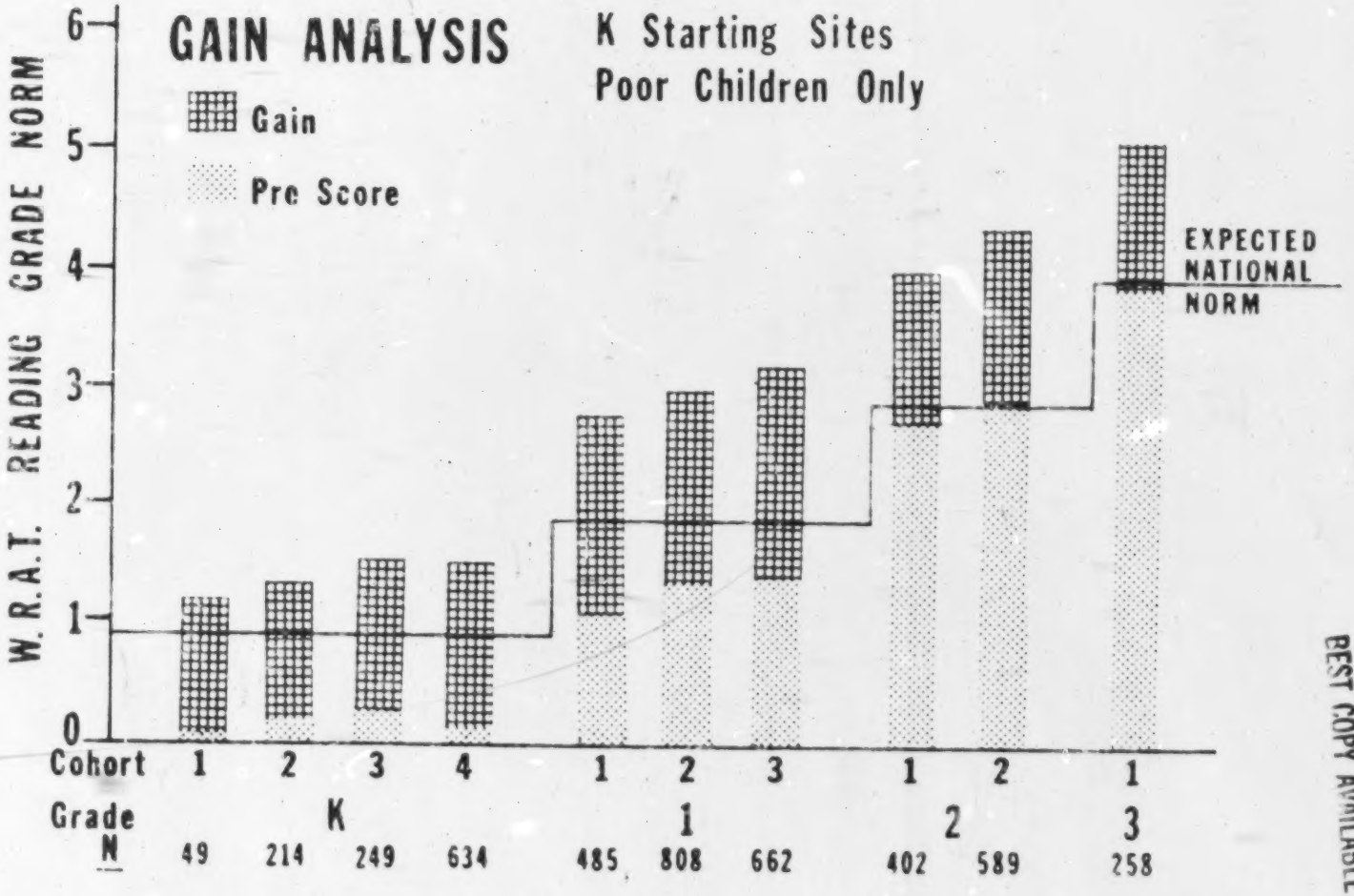
ENGELMANN-BECKER MODEL
FOLLOW THROUGH

Reading



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ENGELMANN-BECKER MODEL
FOLLOW THROUGH

Reading

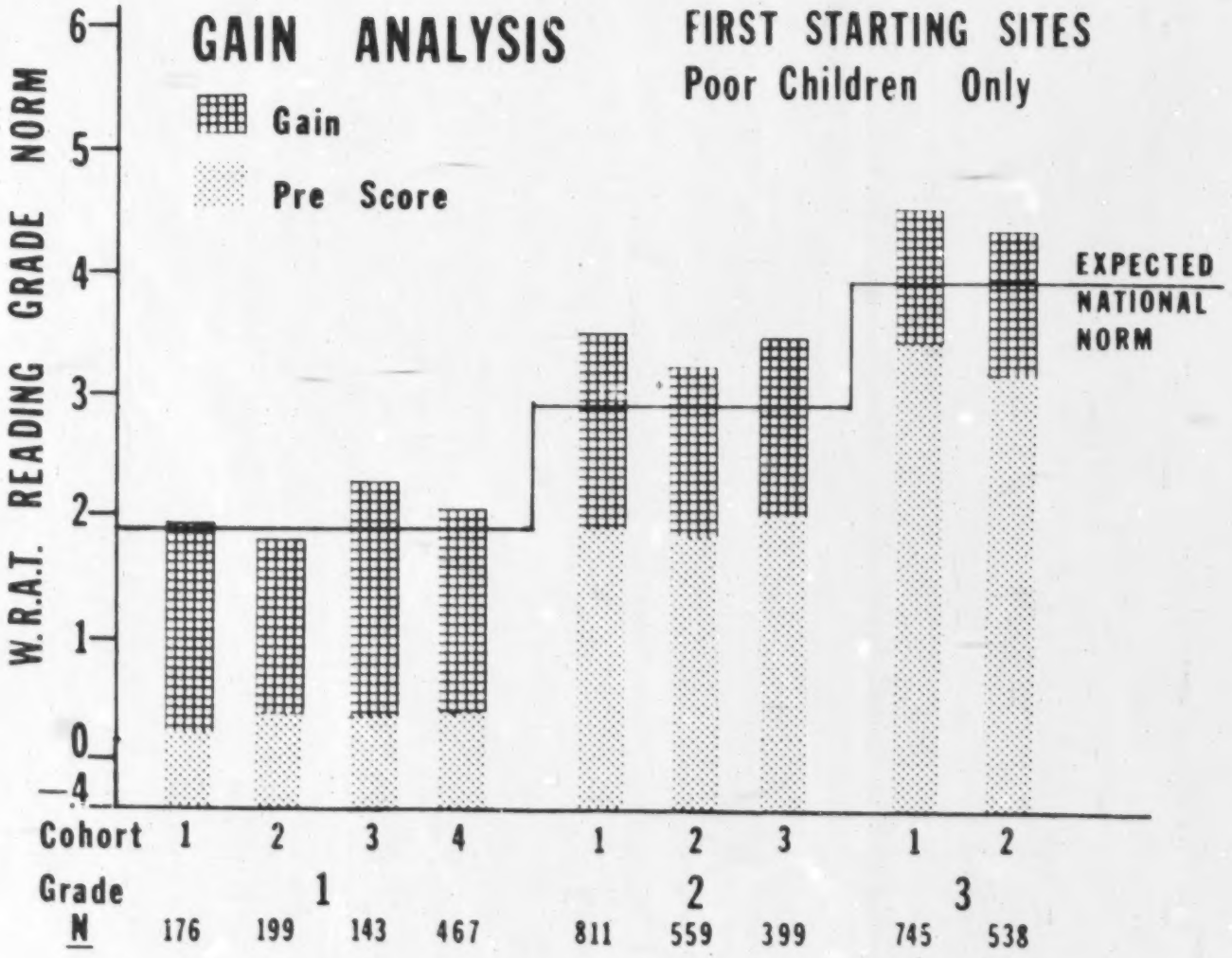

Fig. 6

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ENGELMANN - BECKER
FOLLOW THROUGH

Arithmetic

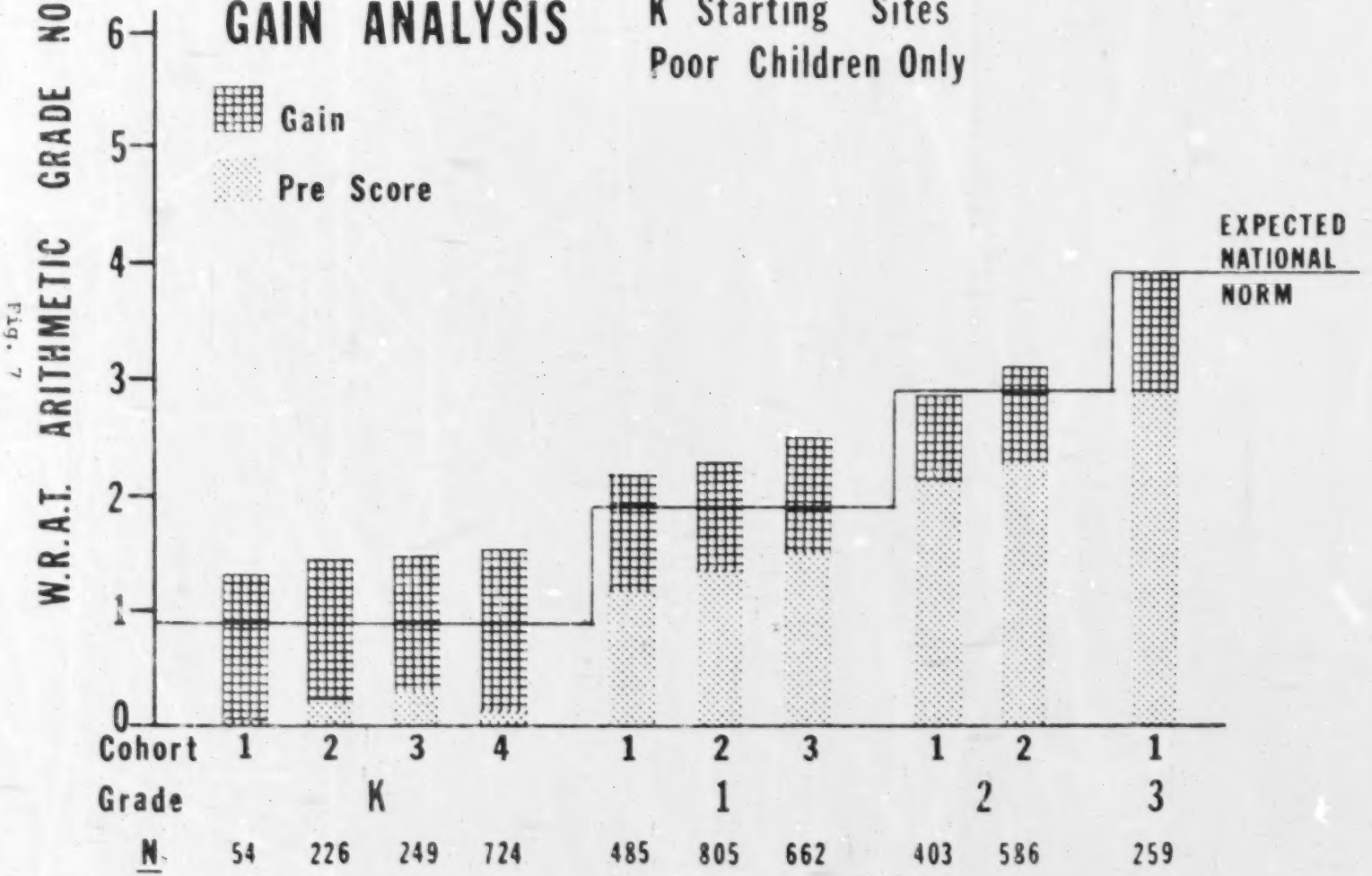

Fig. 7

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ENGELMANN - BECKER MODEL
FOLLOW THROUGH

Arithmetic

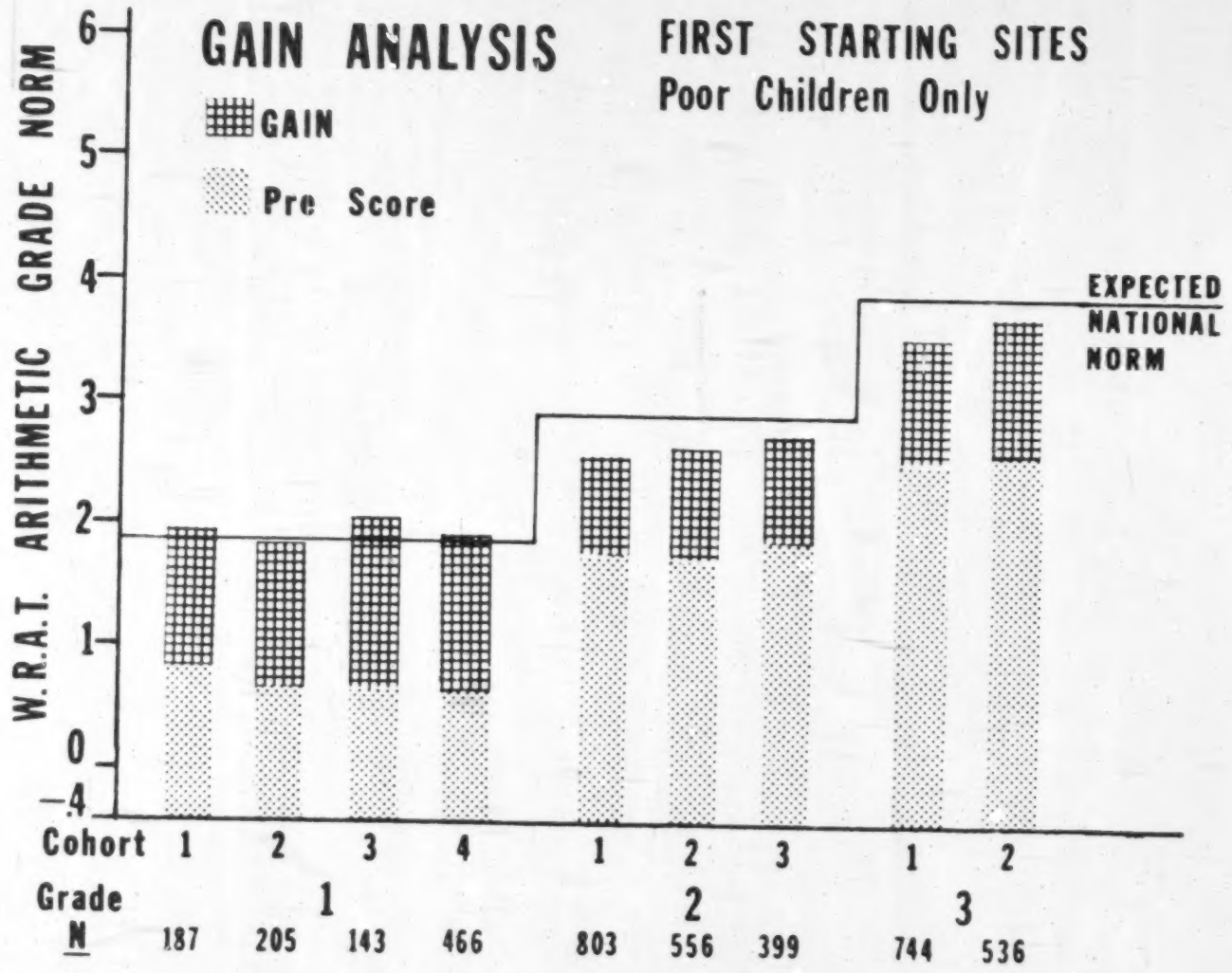

Fig. 8

Table 1

IQ - Gain on the Slosson
Poor Children Only

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K-Starting

Cohort		Pre K-Post K	Post K-Post 1	Post 1-Post 2	Post 2-Post 3
0	Gain		6.2 (57)*	1.4 (125)	-3.3 (85)
	Basis		105.0 - 111.3	107.8 - 109.3	108.0 - 104.7
1	Gain	11.0 (52)	-.5 (482)	.3 (174)	-1.8 (71)
	Basis	105.3 - 116.3	108.1 - 107.6	111.2 - 111.6	116.8 - 115.0
2	Gain	4.2 (269)	.3 (381)		
	Basis	105.3 - 109.5	108.9 - 109.3		
3	Gain	6.7 (135)			
	Basis	108.6 - 115.3			
4	Gain	12.0 (740)			
	Basis	101.6 - 113.6			
$\bar{X}$	Gain	9.63 (1196)	1.28 (920)	.77 (299)	-2.58 (156)

Cumulative Gain Pre k - Post 3 -- 9.1 points

1st-Starting

Cohort		Pre 1-Post 1	Post 1-Post 2	Post 2-Post 3	Retentions 3rd
0	Gain	6.3 (62)	2.3 (373)	1.4 (479)	2.77 (39)
	Basis	86.6 - 93.0	95.5 - 97.8	98.7 - 100.2	85.9 - 88.7
1	Gain	-2.5 (185)	3.1 (773)	-.1 (696)	2.04 (53)
	Basis	98.9 - 96.4	97.0 - 100.1	100.1 - 100.0	83.3 - 85.3
2	Gain	3.5 (250)	1.4 (244)	2.8 (231)	
	Basis	94.3 - 97.8	97.0 - 98.3	98.2 - 101.0	
3	Gain	3.9 (51)	4.3 (42)		
	Basis	97.8 - 101.8	99.4 - 103.6		
4	Gain	8.7 (469)			
	Basis	90.9 - 99.6			
$\bar{X}$	Gain	5.02 (1017)	2.64 (1432)	1.89 (1406)	2.38 (92)

Cumulative Gain Pre 1 - Post 3 -- 8.55 points

* N in parentheses

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Mean Performance on the MAT - Spring 1973

Tables 2 and 3 show the mean performance of the poor children in the "Gains Analysis" on the Metropolitan Achievement Test (MAT) given in the Spring of 1973. Expected grade norms at the time of testing would be 1.8, 2.8, and 3.8 grades respectively for the average child. Our children in K-starting sites are performing above grade level on this test at the end of first and second grade. At the end of third grade, our children perform close to an acceptable level (or above) on this test and onlall subtests except Reading. This subtest requires the student to read a short stoy and then answer questions about it. Analysis shows that our children have difficulty with the nearly unrestricted adult vocabulary used in the MAT stories and questions. These children are still deficient in language concepts (not decoding skills), some of which the "average" child has mastered. In general, our K-starting children did better on the MAT than we anticipated they would.

The children from 1st-starting sites (Table 3) do reasonably well in math at all grade levels, but again fall behind in MAT Reading (comprehension) scores. A possible implication of these findings is that starting earlier (during the kindergarten year) with formal training in language concepts and logical operations is likely to be beneficial to children from economically disadvantaged homes.

Table 2

MAT Grade Norm Scores Spring 73
E-B Follow Through Model

K Starting - Poor - Gains Analysis - Spring 1973

Grade	1		2		3	
Cohort	3 (KF71)		2 (KF70)		1 (KF69)	
	Mean	N	Mean	N	Mean	N
Word Knowledge	2.41	(591)	2.97	(553)	3.49	(252)
Word Analysis	2.25	(590)	3.11	(571)	--	
Reading	2.22	(592)	2.88	(552)	3.25	(250)
TOTAL READING	2.28	(587)	2.92	(544)	3.33	(250)
Language					4.21	(224)
Spelling			3.23	(540)	3.78	(248)
Math Comp.			2.98	(538)	4.13	(236)
Math Concepts	1.99	(591)	2.89	(570)	3.86	(236)
Math Problems			3.06	(542)	3.68	(237)
TOTAL MATH	1.99	(591)	2.83	(560)	3.86	(234)

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Table 3

Metropolitan Achievement Test
Grade Norm Scores
E-B Follow Through Model

1st-Starting - Poor - Gains - Spring 1973

	Primary 1		Primary 2		Elementary	
Grade	1		2		3	
Cohort	4 (1F72)		3 (1F71)		2 (1F70)	
	Mean	N	Mean	N	Mean	N
Word Knowledge	1.88	(372)	2.60	(365)	3.03	(557)
Word Analysis	1.90	(371)	2.69	(365)		
Reading	1.68	(371)	2.49	(362)	2.86	(557)
TOTAL READING	1.78	(370)	2.53	(362)	2.91	(555)
Language					4.07	(513)
Spelling			3.01	(323)	3.32	(530)
Math Comp.			2.84	(336)	3.99	(557)
Math Concepts	1.67	(372)	2.50	(362)	3.47	(552)
Math Problems			2.71	(337)	3.50	(554)
TOTAL MATH	1.67	(372)	2.54	(360)	3.61	(550)

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Preliminary Studies of Teaching Process Within the System

Training and Supervision

We believe training and supervision to be most critical components of our program. The functional role of training and supervision needs to be critically investigated. For various reasons we have not been able to experiment in the field with these variables. Our sites do not like research which might withhold services from their children, nor do we. We were able to pilot one supervision study this past year (Carnine, 1973). Four teachers in Eugene were given after school training in the use of DISTAR Reading, using procedures like those we use in the field. The students of these teachers were given a criterion-referenced test covering a 20-day period of training. Then the teachers received in-class supervision similar to that used in Follow Through. After 6 weeks the children of all five teachers were tested on material from the preceding 20 days of instruction. The children gained significantly in accuracy (45% to 65%) when their teachers received supervision in classroom procedures.

Teacher Performance and Correlational Study of Child Outcomes

We have tried a variety of procedures to get directly coded measures of teacher performance from video tapes which will correlate with gains on continuous tests for the children. For the most part, working with tapes sent in from the field, this effort has not been successful. Attempts to establish controls by having each teacher taped with a middle group and a low group, and by restricting the taping to common tasks in one subject area, were thwarted by different task lengths in various parts of the program, restricted samples of teacher behavior, unknown child entry behaviors, and defective tapings. Because of the high cost of analyzing even two 10-minute tape segments, we have stopped this work until it can be carried out under more controlled conditions.

The procedures we have used to obtain reliable data from video tapes of small group instruction may be of interest. Since the teachers are expected to follow program formats, the first requirement is that the raters know the correct execution of the formats, including correction formats. Because a teacher can run off a number of tasks in one minute, coordinating the observations of two raters takes some doing. We finally chieved this coordination by dubbing a blip to indicate the beginning of a task, defined as a teacher presentation and a required group response. For each task segment, we rate the following variables separately for initial tasks and correction tasks:

Format: The teacher correctly followed the format prescribed by the program, or she did not (F+, F-).

Group Response: All members of the group answered correctly, at the same time, or they did not (R+, R-).

Teacher Reaction:

a. Praise given when R+ (R+/P).
b. Praise given when R- (R-/P).
c. Correction made when R+ (R+/C).

d. Correction made when R- (R-/C).
e. Goes on to next task when R+ (R+/T).
f. Goes on to next task when R- (R-/T).

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The "good" DISTAR teacher should use correct formats (P+%) and show a high percentage of reactions a, d, and e above. We also believe that fast pacing of the task is very critical, but have not yet obtained a reliable measure of tasks taught per minute which is adjusted for task length. With an N ranging from 16 to 24 10-minute tapes, the two-rater percentage agreements were between 60-69 for 6 variables, 70-79 for 1 variable and 80 or above for 12 variables. Poor tape quality contributes to much of the unreliability.

Ten-minute tapes on 9 groups of Level I instruction in reading and 9 groups of Level 2 instruction were analyzed. The teachers had been rated by supervisors as being high (3) middle (2) or low (1) in teaching skills. Child gain was measured by days gained on the continuous tests for reading during that school year, adjusted for the number of school days between first and last testing. An average test gain was computed for all children in a group. The results from this study suggest the following:

1. The more often a group shows an 100% correct response (P+%), the higher the test-days gained. The correlation is about .60. This could be more of a function of child behavior than teacher behavior, and is therefore not interpretable without better controls. It could mean, however, that the better teacher gets her children performing to criterion and keeps them there.

2. Individual teacher performance measures did not predict child test gains, nor did an aggregate of teacher performance measures (excluding per cent of R+).

3. An aggregate of teacher performance measures (sum of percentages for each measure, taking into account a "good" and "bad" direction, and excluding per cent R+) correlated .54 with supervisor's ratings of teacher performance.

This is just a very crude beginning suggesting that there may be ways to measure teacher performance within the small-group-teaching phase of our system which will relate to outcome data. We are currently into a study examining ratings by two supervisors on more than 250 teachers and aides in our Follow Through sites which we hope will enable us to examine teacher implementation of program and instructional skills in relation to child outcomes. If this analysis proves fruitful, we plan to get a new group of video tapes on excellent and poor teachers (defined by ratings) and then examine larger samples of their behavior using video tapes.

Experimental Studies of Teacher Performance

Use of signals: A standard part of the format for small group instruction is to use signals to get attention and to get the children to respond together. Several studies have been carried out to examine the functional effects of signals on attending, responding, and following the lead of another child. The first study (Cowart, Carnine, and Becker, 1973) introduced signals into two regular second-grade classrooms for large group instruction (25-30 children) in arithmetic. An ABA design was used with individual observation being made on 8 children in one class and 9 in the

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other. The children were given daily practice in two kinds of arithmetic problems. In the A condition the teacher did not give the children any specific signal in response to her question beyond the question itself. In the B condition, the teacher gave a specific signal, a nonaudible hand signal, following the question.

The analysis showed good reliability in measuring the dependent variables and indicated that the use of signals in both classes clearly increased attending, increased responding, and reduced the amount of following the lead of other children.

A second signals study (Cowart, Carnine, and Becker, 1973) was carried out during small group DISTAR instruction with a group of first graders who had had 6 months of DISTAR instruction. An ABA design, where the A condition used signals and the B condition did not, showed that lack of signals increased following, but with this experienced group dropping the signals did not decrease attending or responding. There were two problems with this study in terms of demonstrating the functional properties of signals. With experienced subjects, the signal may no longer be necessary to get the children to attend and respond. There may be enough conditioned reinforcers operating in the setting to keep behavior going without signals. A study using inexperienced students in small group instruction is underway to clarify this question. Secondly, it was observed that when signals were dropped, the teacher picked up the pacing of her tasks. There were shorter pauses between the tasks, and more tasks presented per minute. In the planned study, task pacing will be controlled.

Pacing

For several studies, pacing was defined as the interval between the children's response ending one task and the start of the next. With one group of inexperienced preschoolers working in a group with minimum social reinforcement, the shift from a 2.5 second pause between tasks to a 5 second pause was enough to completely disrupt the group and halt the experiment. In a subsequent study, first grade children experienced in DISTAR instruction were studied under conditions where normal teacher social reinforcement was provided. When the between-interval during reading was increased from 1.9 to 3.3 seconds on the average, attending and responding decreased for four days and then returned to their previous level. With the same children during Arithmetic, the between-task interval was moved from 2.0 to 4.7 seconds on the average. During this period the teacher also looked at the blackboard. Attending and responding during task decreased rapidly. When social reinforcement was provided again between tasks, but the long interval maintained, most of attending and responding during task returned. Thus, given a normal teacher-child supportive interaction, a slow pacing of tasks in this sense does not appear to be detrimental.

In another study, pacing was defined as the number of tasks completed per minute. In an AB design, it was found with a top group of students that increasing the tasks per minute increased attending and responding, but did not affect accuracy of responding on a test given after each lesson (Cowart and Carnine, 1973).

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Corrections

Several studies have been attempted to study the functional effects of different kinds of correction procedures on the rate of acquisition of a set of symbol identification (letters-sounds) problems. As yet no clear differences among procedures have been found. We are still trying to learn to deal with this kind of study. Two studies are now in progress.

Programming Strategies

Carnine has shown that when teaching a set of tasks showing some common properties, learning of the set is more rapid (and errors fewer) if the tasks more likely to be confused with each other are separated by easier to differentiate tasks. Carnine has also provided evidence to show better concept learning when the set of tasks presented could not be responded to correctly by fixing on an irrelevant characteristic, and where all relevant characteristics had to be identified. Finally, Carnine has provided evidence to show that presenting pairs of concept instances (geometric forms) which differed in only one characteristic (therefore isolating a characteristic as relevant or irrelevant) led to faster learning than if the program involved presentation of random pairs.

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